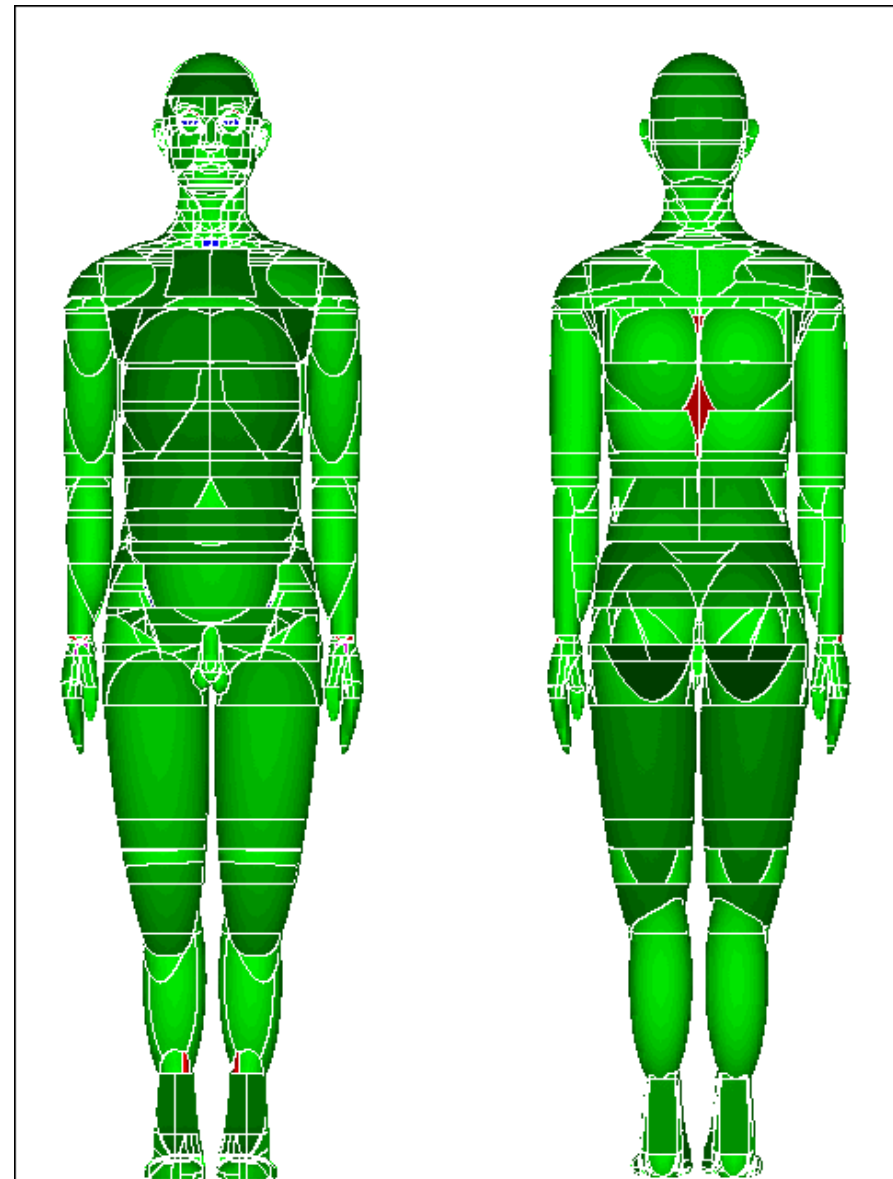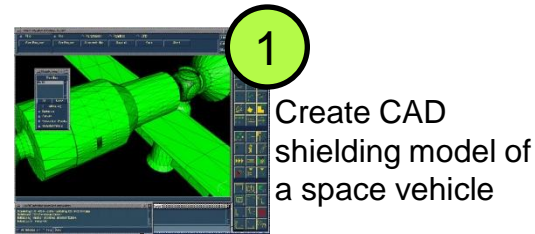OLTARIS provides the ability to add a human phantom into an uploaded space vehicle shielding distribution, to enable the calculation of whole body effective dose.

The **CAM** (Computerized Anatomical Male) and **CAF** (Computerized Anatomical Female) are established reference body models that are based upon geometric models of the body's tissues.

The phantom tissue distributions for either the CAM or CAF have been pre-calculated and are added to the space vehicle thickness distributions after they are uploaded to OLTARIS.
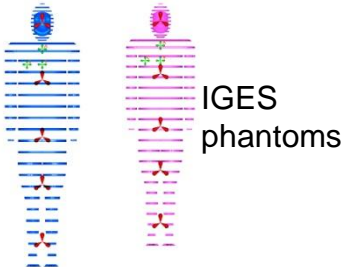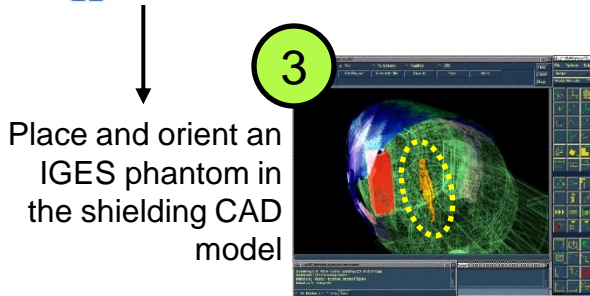
OLTARIS
On-Line Tool for the Analysis of Radiation In Space

Body Phantom Process Overview

NASA

1 Create CAD shielding model of a space vehicle

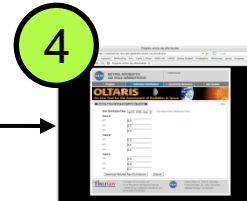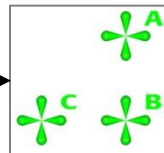**2** Download IGES phantoms from OLTARIS

IGES phantoms

3 Place and orient an IGES phantom in the shielding CAD model

To provide the most flexibility, OLTARIS supports a process that allows a user's analysis to reflect the phantom's size, location, and orientation.

CAD-compatible phantom proxies are available to download and import into the space vehicle CAD model.

The phantoms' body tissue distribution is combined with the vehicle shielding distribution after it has been uploaded to OLTARIS.
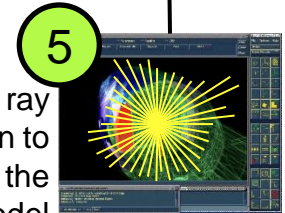
6 Upload Thickness Metafile of vehicle shielding distribution to OLTARIS

Thickness Metafile of ray trace results

5 Use this ray distribution to ray trace the shielding model

4 Enter the (x,y,z) locations of the IGES phantom A, B, and C points, using the OLTARIS "Download Rotated Ray Distribution" form, to create and download a ray distribution that matches the phantom orientation
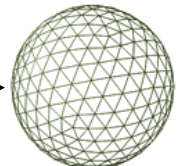
Body Phantom proxies are available to download from the OLTARIS web site. The phantom proxies are in an IGES file format that is compatible with any modern CAD program. They include several features designed to make it easy to properly add CAM or CAF distributions to your vehicle shielding distributions.
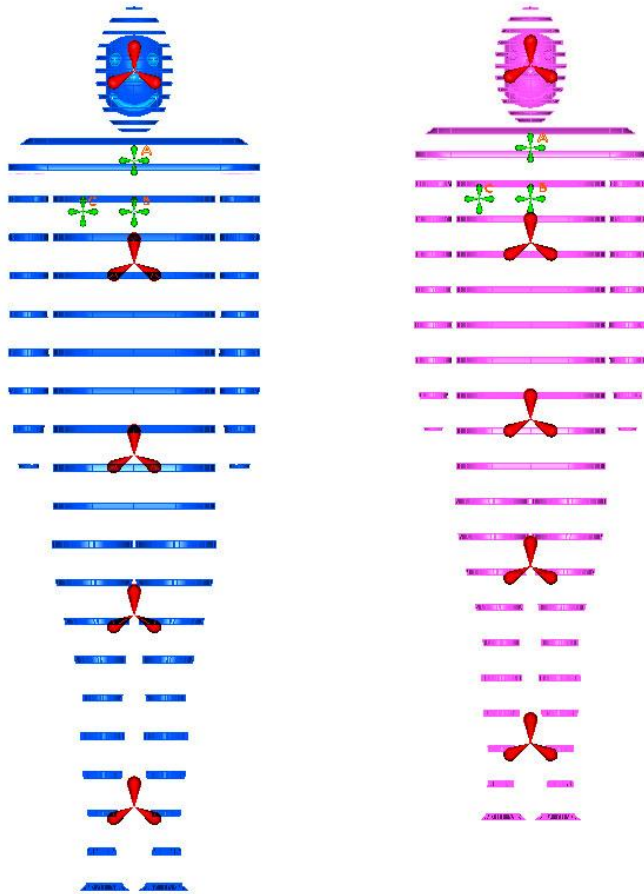

Each phantom proxy has been created to accurately reflect the outer dimensions and body posture of the CAM and CAF models.
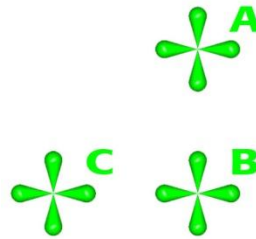
The relative positions of these three points, labeled "A", "B", and "C", uniquely define the orientation of the phantom within the shielding CAD model. Using the locations of these points, OLTARIS will generate a custom ray distribution that will allow it to combine the CAM and CAF distributions with the vehicle shielding distribution.

These five points define the ray tracing target points used for a five-zone full body effective dose calculation. Combined ray trace results from these five points will better capture the variation in the radiation environment inside the space vehicle when compared with results from a single point. The five vehicle distributions will be combined with 500 body tissue distributions by OLTARIS.

Zone 1 (Head)
Zone 2 (Chest)
Zone 3 (Pelvis)
Zone 4 (Thighs)
Zone 5 (Calves)
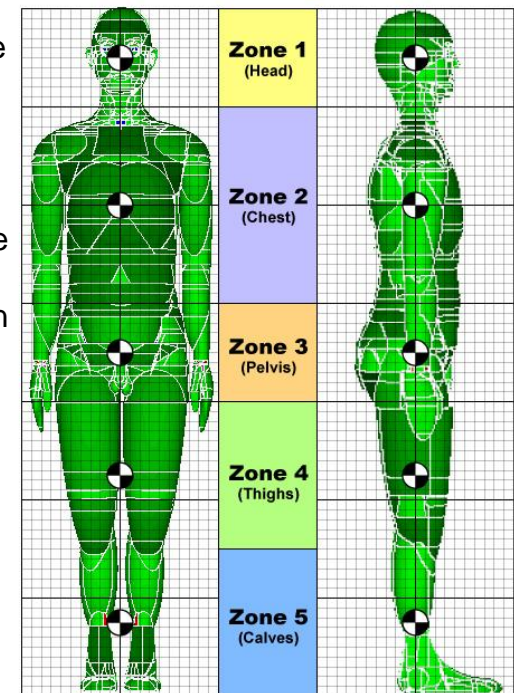
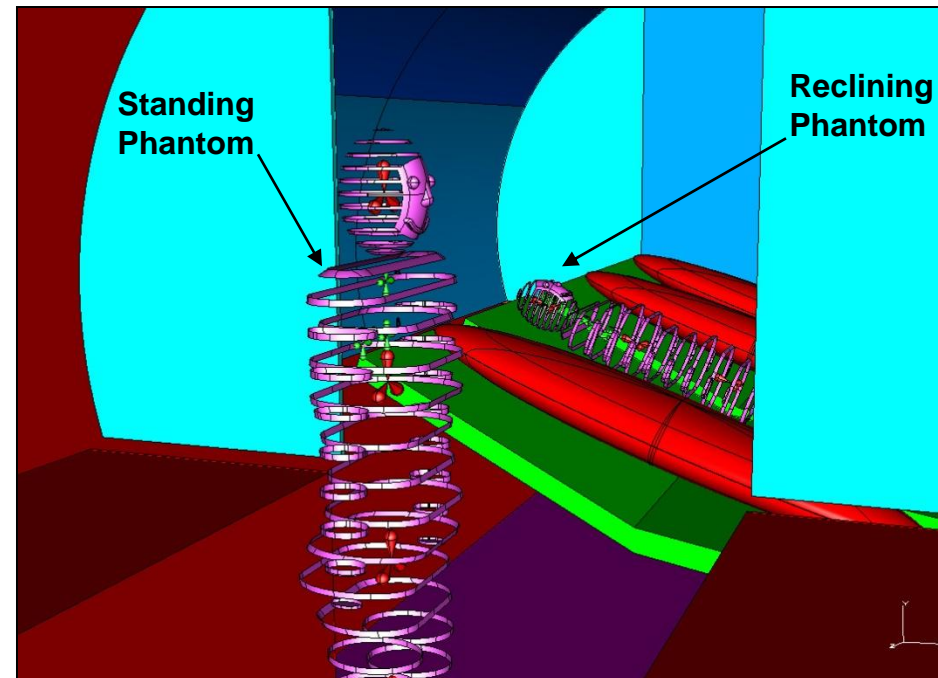# Body Phantom ABC Points

(x,y,z)

A

C   B
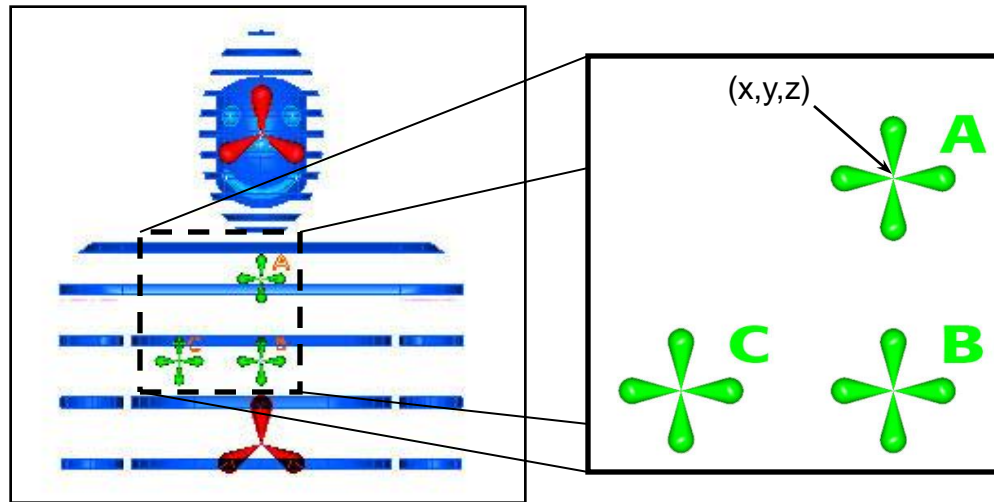
Each phantom proxy includes three points, labeled "A", "B", and "C". Once the IGES phantom is oriented inside the space vehicle CAD model, the (x,y,z) locations of the A, B, and C points let OLTARIS generate a custom ray distribution that will allow the CAM and CAF distributions to be properly combined with the vehicle shielding distribution. The point coordinates are entered using the "Download Rotated Ray Distribution" form.
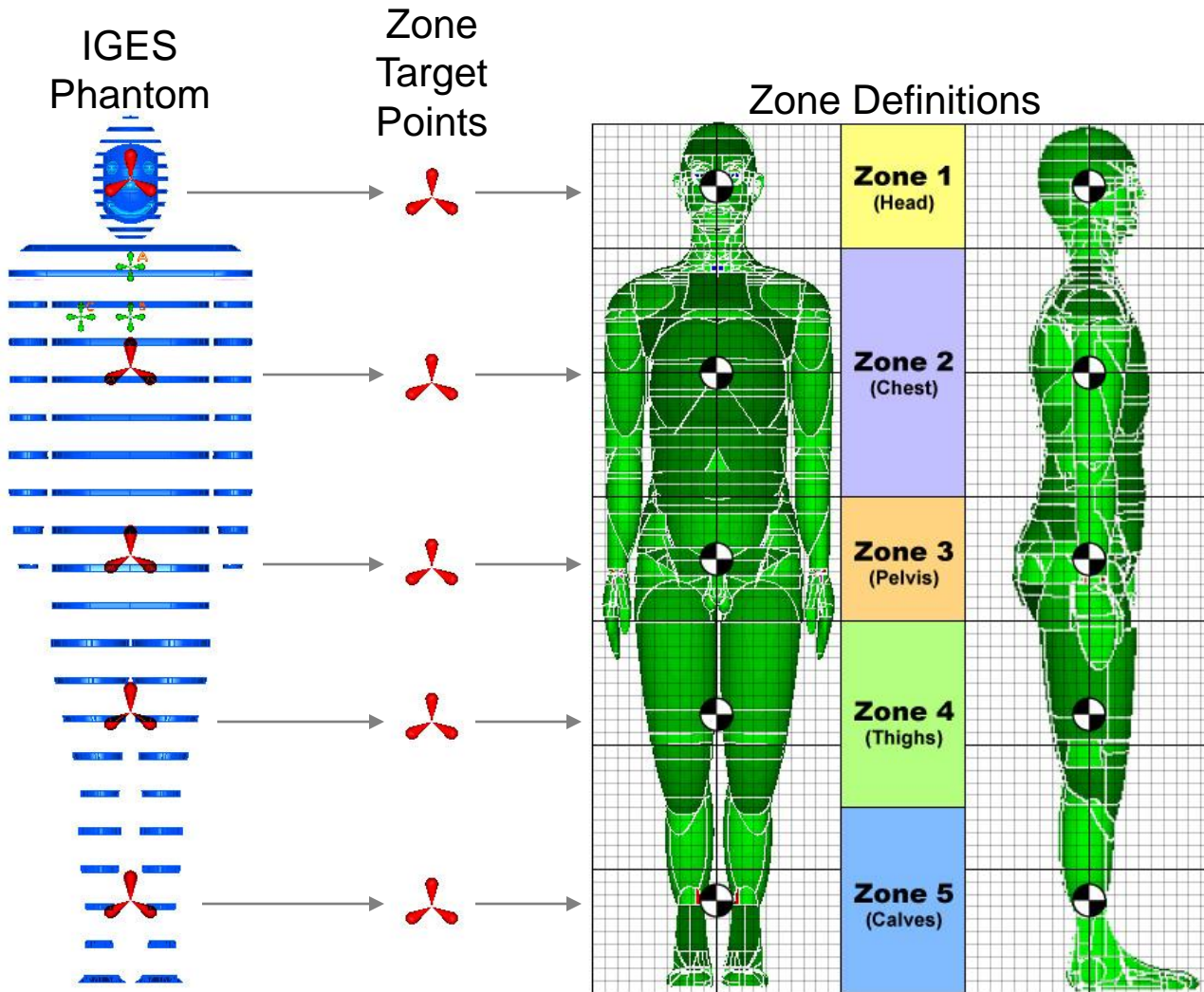

Standing Phantom

Reclining Phantom

Body Phantom Zone Points

IGES Phantom

Zone Target Points

Zone Definitions

Zone	
Zone 1	(Head)
Zone 2	(Chest)
Zone 3	(Pelvis)
Zone 4	(Thighs)
Zone 5	(Calves)

Each phantom proxy includes five points spaced along the length of the body. These correspond to five zones that are used in the calculation of the full body effective dose. Roughly 500 body tissue distributions are combined with the vehicle thickness distribution(s) to compute a whole body effective dose.

If the user ray traces their CAD shielding model using each of the 5 zone target points, the 5 thickness distributions that result can be uploaded to OLTARIS, where they will be combined with the 500 CAM/CAF body tissue distributions.

Using multiple vehicle thickness distributions allows OLTARIS' results to better reflect variations in the vehicle's interior radiation environment.